Synthesis and Design of Processing Networks: Stochastic Formulation and Solution

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Synthesis and Design of Processing Networks: Stochastic Formulation and Solution

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1. Introduction

Objectives:

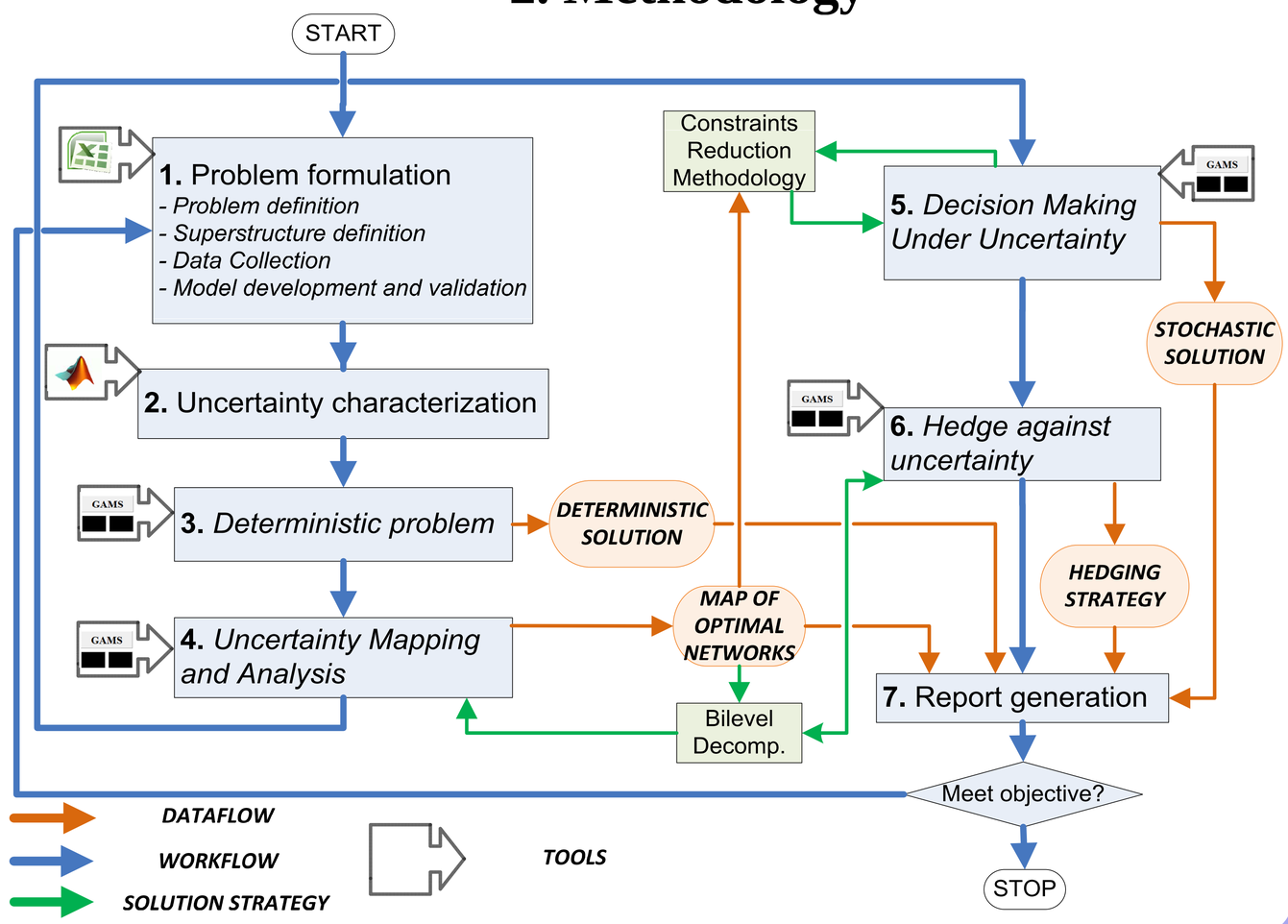
Development of a systematic framework for synthesis and design of processing network under uncertainty.

Integration of software, tools, methods and solution strategies into a generic toolbox for the solution of networks synthesis problems.

Demonstration of the developed framework through the formulation and solution of industry oriented case studies

Case Study: Soybean Processing Network (in collaboration with Alfa Laval)

2. Methodology

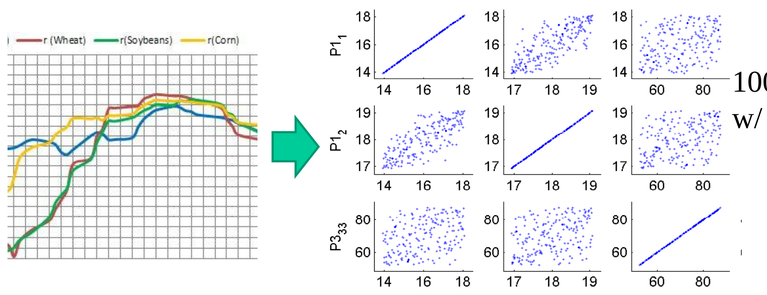


3. Case Study: Soybean Processing network

1. Problem Formulation

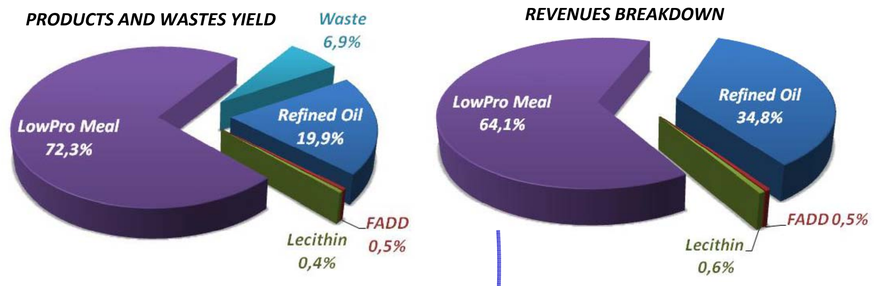
Objective function: max NPV
2 raw materials, 42 processing technologies, 21 products
300,000+ equations, 140,000+ variables (deterministic)
11 uncertain data (sources: technical, market, supply chain)
entire value chain considered

2. Uncertainty Characterization

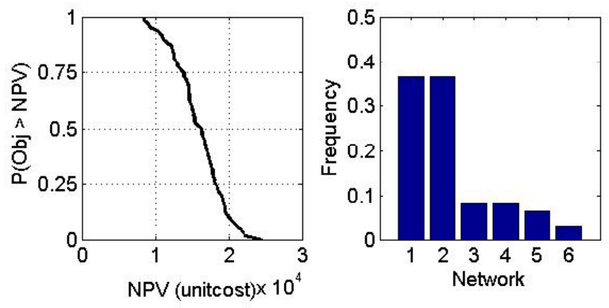


100 Monte Carlo samples w/ correlation control

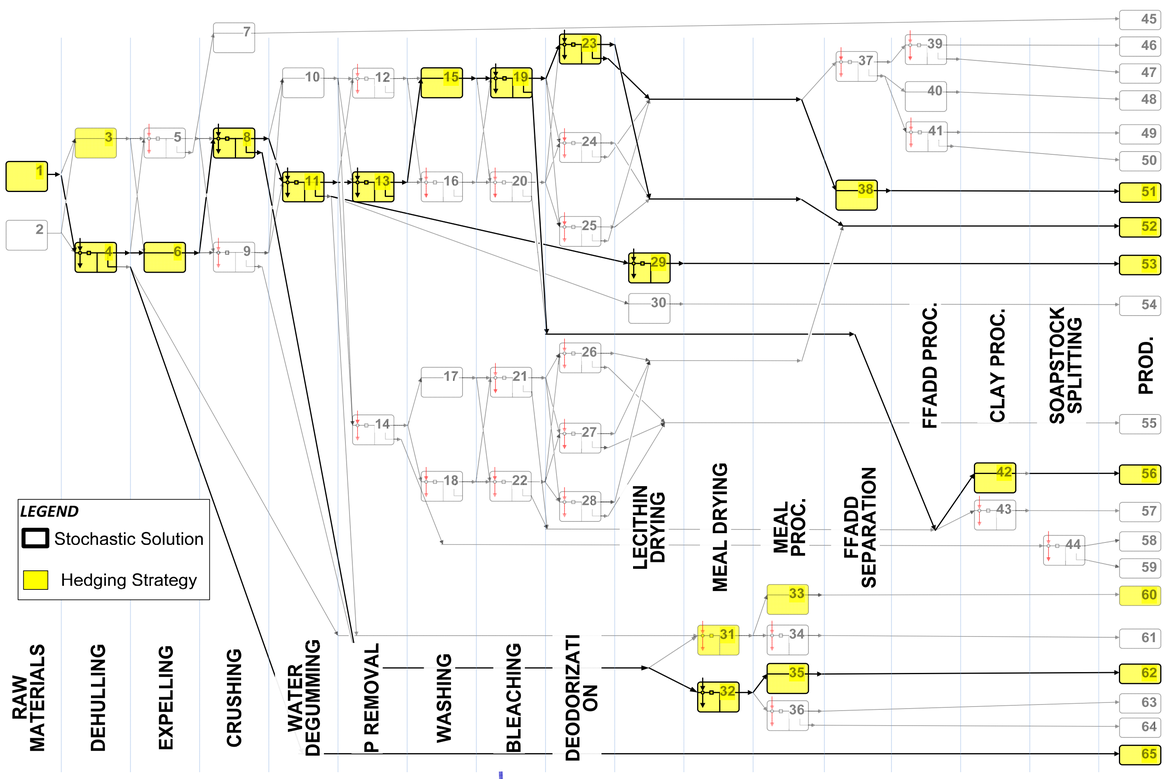
3. Deterministic Solution



4. Uncertainty mapping



5. Decision Making Under Uncertainty and 6. Hedge against uncertainty



7. Report

Solution	NPV (unitcost)
DETERMINISTIC	106.6
STOCHASTIC	108.3
HEDGING Strat.	**115.3 (+8.2%)**

Indicator	Value (unitcost)
EVPI	19.3
VSS	1.8
VSS_H	8.8

Conclusions

✓ Uncertainty is characterized and its consequences on the optimal network is assessed

✓ A strategy to hedge against the uncertainty is identified

✓ 8.2% NPV improvement is obtained

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